ANNUAL REPORT 1964

MARMORA

water treatment plant

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Marmora Local Advisory Committee,
Village of Marmora.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Marmora Water Treatment Plant, OWRC Project No. 58-W-25.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water supply.

Yours very truly,

D. S. Caverly, P. Eng.,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Marmora Water Treatment Plant, OWRC Project No. 58-W-25 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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MARMORA
water treatment plant

operated for

THE VILLAGE OF MARMORA

by the

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Regional Supervisor: D. A. McTavish
Operations Engineer: J. N. Dick

801 Bay Street — Toronto 5

'64 REVIEW

It is the object of this report to present a comprehensive review of the operation of the Marmora Water Treatment Plant during 1964. Included are figures on costs handled through the offices of the Ontario Water Resources Commission, as well as flow records and all significant operating data.

A total of 18,690,000 gallons of treated water was pumped to the Marmora water distribution system during 1964 at a cost of $515.56 as processed by the OWRC. This cost figure does not include payroll, power and miscellaneous general supplies and hardware expenses. These costs were absorbed directly by the Village.

The plant and system are operated for the OWRC by Mr. William Bishop, a municipal employee. Mr. Bishop should be complimented on the interest and enthusiasm given to the operation.

GLOSSARY

BTU	British Thermal Unit
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpm	gallons per minute
lin. ft.	linear feet
mgd	million gallons per day
pH	a symbol for hydrogen-ion concentration; a pH test determines the intensity of the acidity or alkalinity of a water
ppm	parts per million
ss	suspended solids
SWD	side wall depth
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)
turbidity	a measurement of the amount of visible material in suspension in water

HISTORY
1960 - 1964

INCEPTION

The Crowe River provides an ample quantity of water for the Village of Marmora, but the normal colour in the river is about 20 PPM. A study was made to determine the most suitable method of reducing this colour to tolerable limits. This study was conducted in 1960 by Sparkler International Limited under the direction of the OWRC.

The firm of R. V. Anderson and Associates, Toronto, Consulting Engineers, was engaged to prepare plans and specifications for the project.

CONSTRUCTION

The water treatment plant and appurtenances were constructed by Tatham Company Limited, Belleville. The standpipe was constructed by Horton Steel Works Limited, Fort Erie and the water mains constructed by Armstrong Brothers Company Limited, Brampton. The construction was completed early in 1962 and the Division of Plant Operations took over the supervision of the project. The project is operated by the Marmora Public Utilities Commission.

TOTAL COST

$ 212,977.01

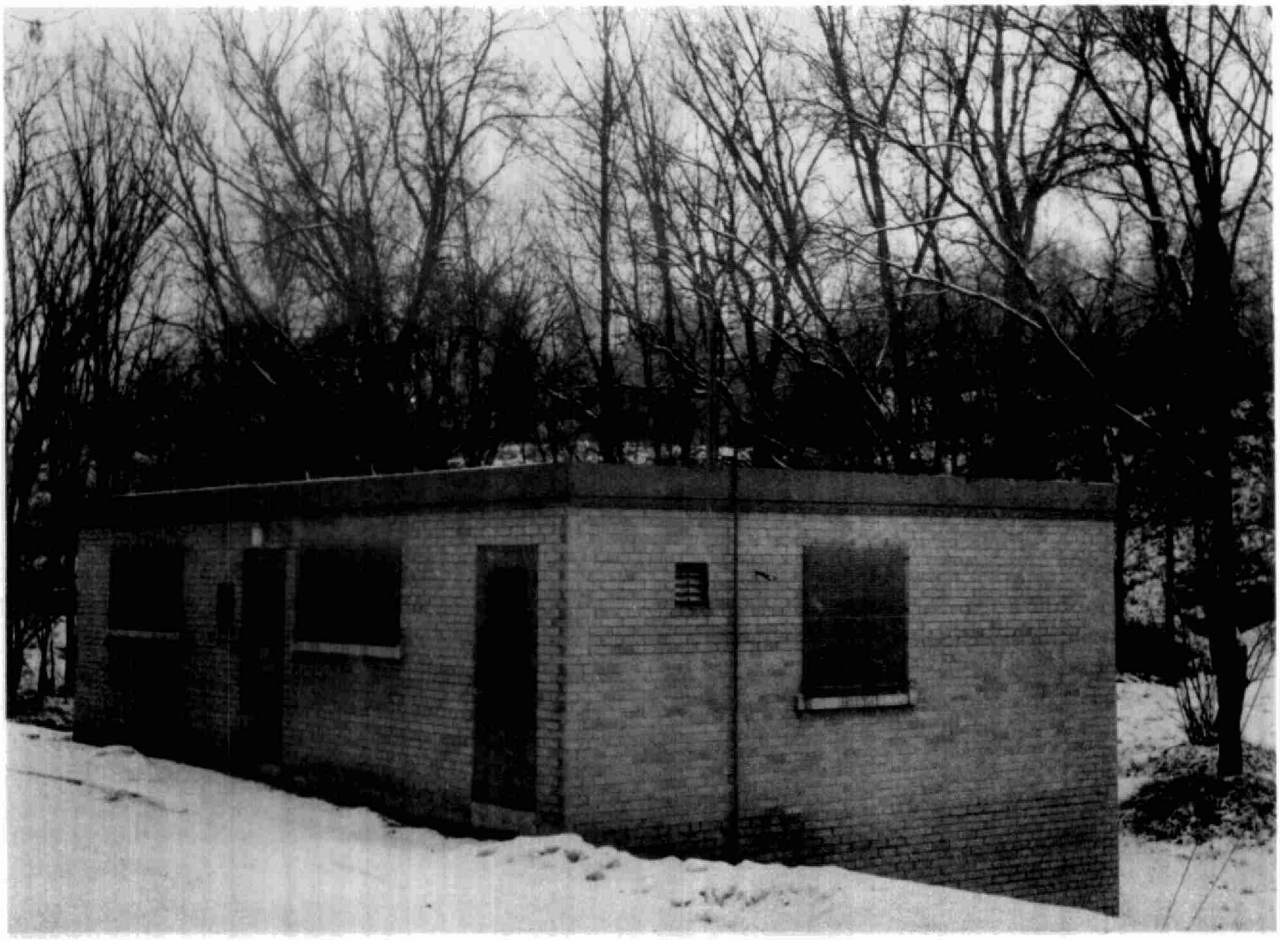
W. BISHOP
OPERATOR

Project Staff

COMMENTS

Mr. William Bishop is a municipal employee who has operated the treatment plant and distribution system since its completion early in 1962.

Frequent inspection of the Marmora project by OWRC head office engineers and technicians have found the plant well maintained and operated.



Description of Project

Water from Crowe Lake enters the system through a 10" screened intake in one of the old sluice-ways. The water depth at the intake is approximately 10 ft. and flows rapidly at all times of the year. The water flows by gravity from this point to the filtration room. A static head of approximately 2 ft. between the lake and the operating water level in the plant provides a sufficient supply to the system. The operating floor of the filter room is approximately 6" above lake water level, to prevent any possible overflow of the open detention and filter chambers.

A concrete overflow chamber receives water from the 10" intake line. An adjustable overflow weir establishes the operating water level in the detention and filter chambers. Water enters the filter side at any required rate and the rest of the incoming water spills into a drain pit, where it flows by gravity back to the river. This overflow chamber eliminates an automatic water level control valve. It also permits a rapid flow of water through the intake line, which prevents clogging or freezing.

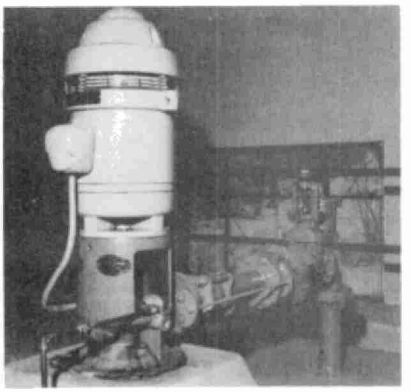
Water flows from this chamber, on the filter side, into a concrete detention chamber. The detention chamber is approximately 15 ft. long x 5 ft. wide and has up and down baffles. It provides 15 minutes detention at a flow rate of 150 Imperial gallons per minute. Powdered activated carbon is metered into

the water at the beginning of the detention chamber. This is fed by a Wallace and Tiernan A-690 volumetric feeder, which is equipped with a bag loader and dust collector

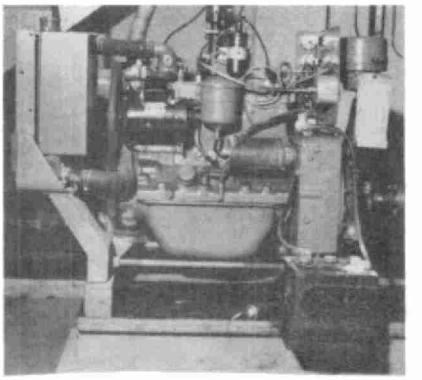
After the detention chamber, the water enters a slurrying chamber ahead of the filter. This chamber is designed to create a turbulence during the precoat recirculation cycle to completely slurry the precoat powder. During the filtration cycle, body-feed diatomite is metered into this chamber by a Wallace and Tiernan Model A-710 wet slurry feeder

Water from the slurrying chamber, with carbon and diatomite in suspension, enters through an opening at the bottom of the concrete filter chamber. In this way, a sweeping action across the floor of the filter chamber is achieved, which picks up any carbon or diatomite that may have settled between the filter elements. This higher velocity flow occurs under the filter elements and thus has no effect on "cake washing".

In the filter, the water is drawn through stainless steel filter elements by an eight stage, 15 HP turbine pump. The elements are covered with polyethylene cloth and precoated with diatomaceous earth. The diatomaceous earth layer removes the carbon and all suspended solids from the water. The body feed diatomite builds up with these solids to form a permeable cake, thus increasing



MAIN DUTY PUMP AND DISCHARGE PIPING



THIS GASOLINE ENGINE DRIVES THE STANDBY PUMP, IN CASES OF POWER FAILURE

the solids holding capacity of the filter and lengthening the filter system.

The filtered water is drawn through the filter elements to a bottom collector manifold. This manifold runs through the concrete wall of the filter chamber where it is connected to the suction of the turbine pump. A standby gasoline engine driven-pump is connected in parallel with the turbine pump to provide service during power failure.

The suction head of either pump is used to draw the water through the filter, while the discharge head is used to pressurize the mains and fill the standpipe. A 0 to 30" Hg. vacuum gauge is connected into the suction line ahead of the pumps and this gauge indicates the relative clogging load on the filter.

Chlorine is injected into the water and the total gallons treated are shown on a meter before the water leaves the building. The water levels in the standpipe are controlled by a mercury column altitude valve in conjunction with a telemetering system to the filtration plant. When the water in the standpipe has reached its maximum level, a signal from the telemeter system starts a 1 HP holding pump, which recirculates water through the filter to hold the cake on the elements. The turbine pump and feeders then stop. All electric controls have "hand-off automatic" selectors so that the system may be run on manual or automatic.

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JAN	123.14									123.14
FEB	59.00					57.50				1.50
MARCH	15.35									15.35
APRIL	1.50									1.50
MAY	8.00								6.50	1.50
JUNE	35.92									35.92
JULY	159.40					156.40				3.00
AUG	59.00					57.50				1.50
SEPT	1.50									1.50
OCT	1.50					57.50				1.50
NOV	118.25					57.50			60.75	
DEC	(67.00)					(70.00)				3.00
TOTAL	515.56					258.90			67.25	189.41

BRACKETS INDICATE CREDIT

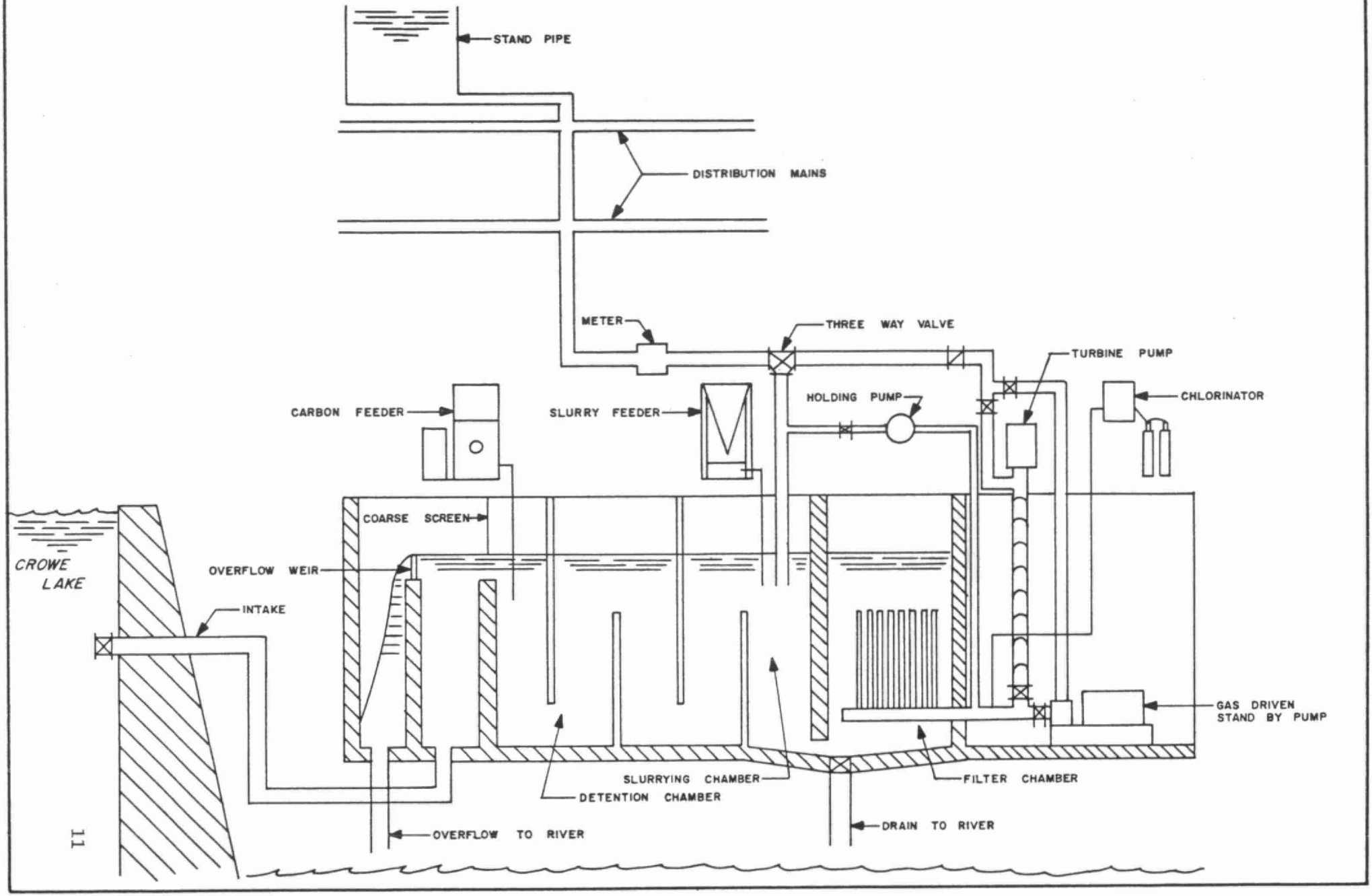
YEARLY COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS
1962	11.992	$824	* $2.46	$68.71
1963	16.607	937	2.81	56.42
1964	18.690	515	1.52	27.55

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

Technical Section

SCHEMATIC DIAGRAM OF MARMORA WATER SYSTEM



Design–Data

DESIGN

Type of Plant - Diatomite filtration plant.

Design Population - 2,000

Design Plant Flow - 250,000 gpd.

Per Capita Flow - 125 gallons

EQUIPMENT

Activated Carbon Feeder - Wallace and Tiernan - Type A-690

Diatomite Body Feeder - Wallace and Tiernan - Type A-665

Chlorinator - Wallace and Tiernan - Type A-741.

CIRCULATING PUMP

Armstrong Pump - Model 1552

Capacity - 42 IGPM @ 29 foot head

Motor - Century, type SC, 550 volts, 3 phase, 1.4 amps.

RPM - 1750.

HP - 1

DUTY PUMP

Layne Turbine Pump - 8 stage - Type 4 inch SDH

Capacity - 125 IGPM @ 127 foot head.

Motors - US Motors - Holloshaft, Type HU 550 volts, 3 phase, 16 amps.

RPM - 1800

HP 15

STAND-BY

Canada Pump - Centrifugal Split Case - 3 inch by 4 inch Class "SAC".

Capacity - 180 USPGM @ 217 foot head

Motor - Continental Engine - gas motor

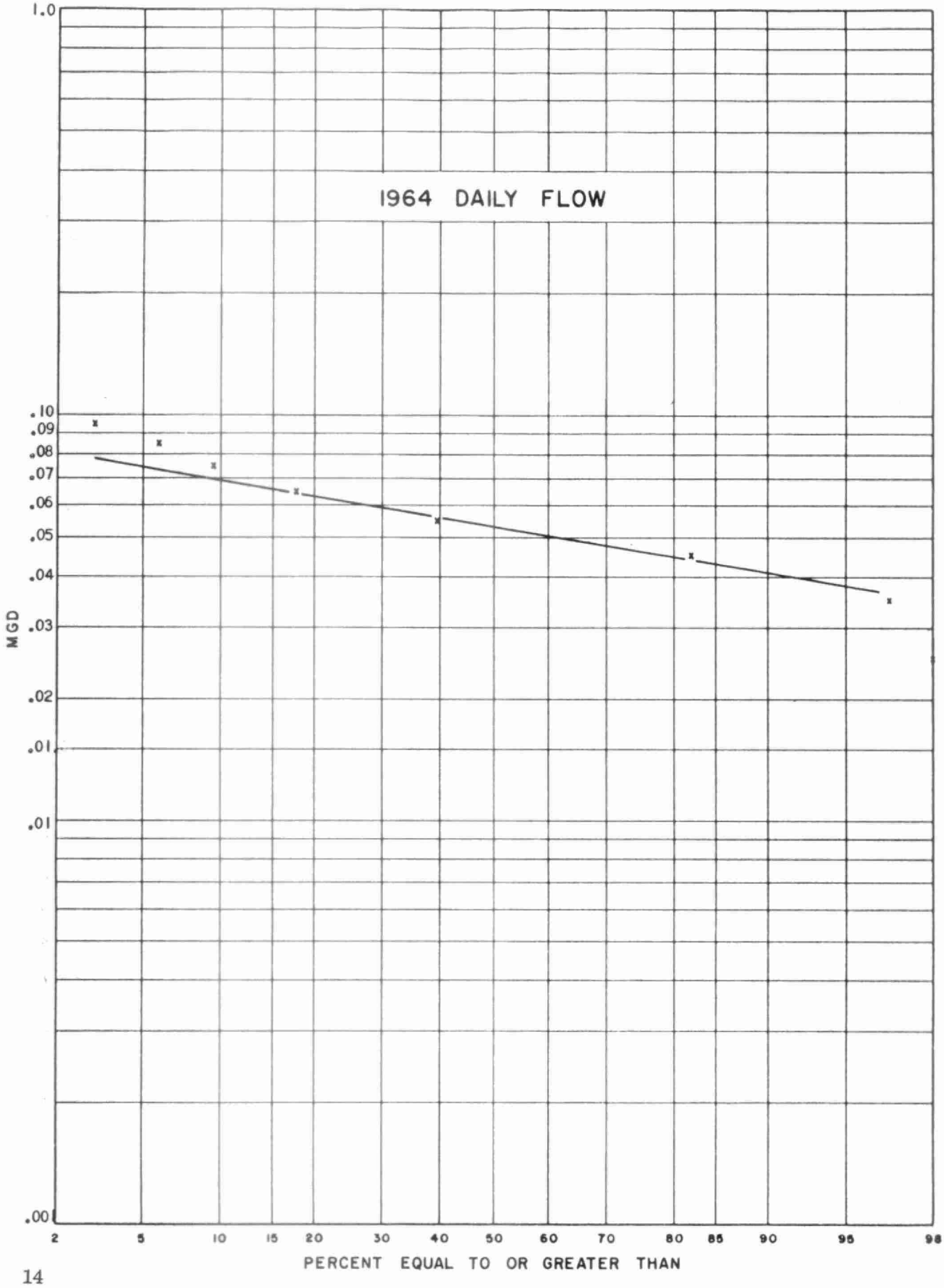
Type - F-162

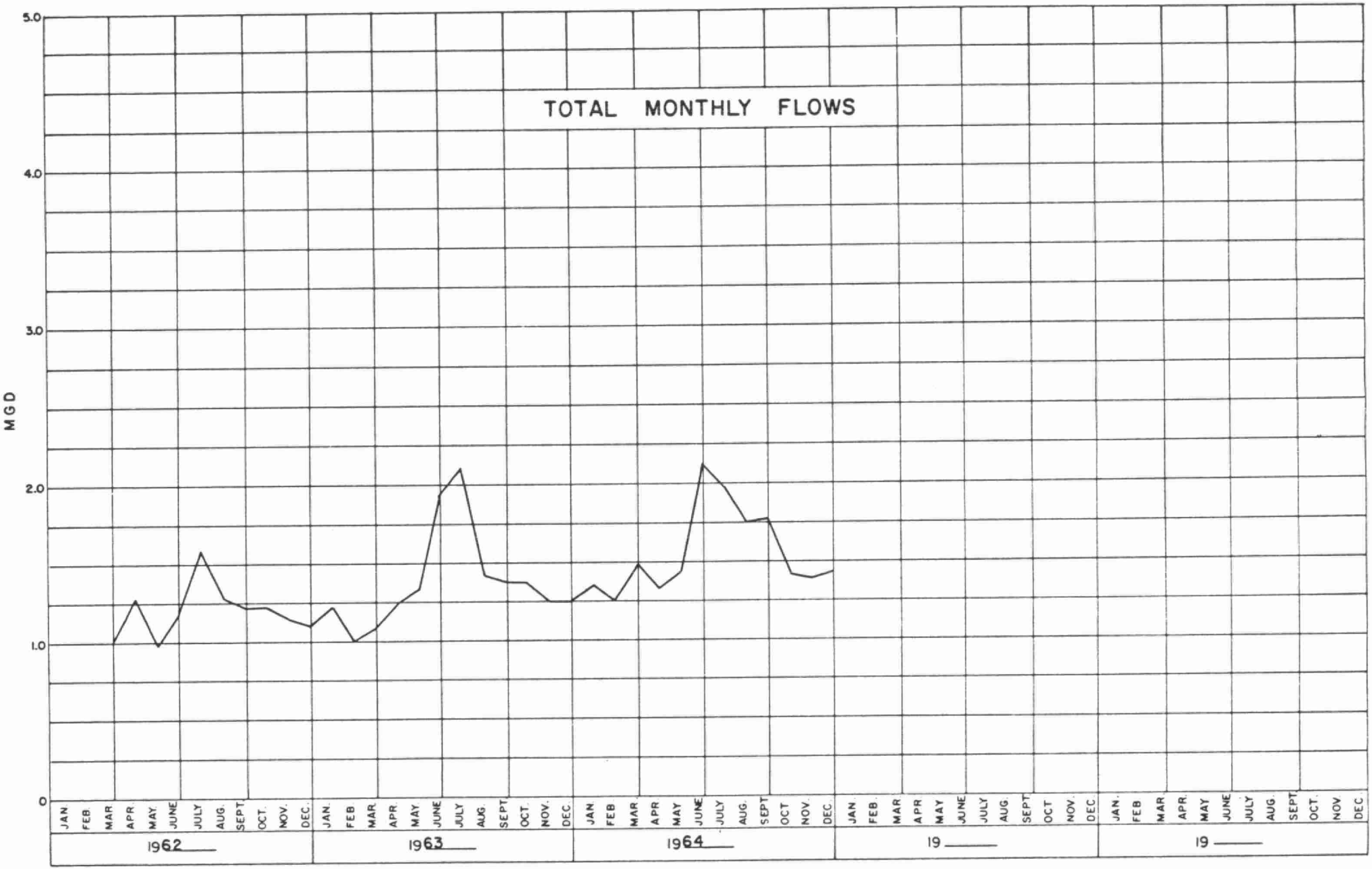
Stand-by Capacity - 500,000 gallons.

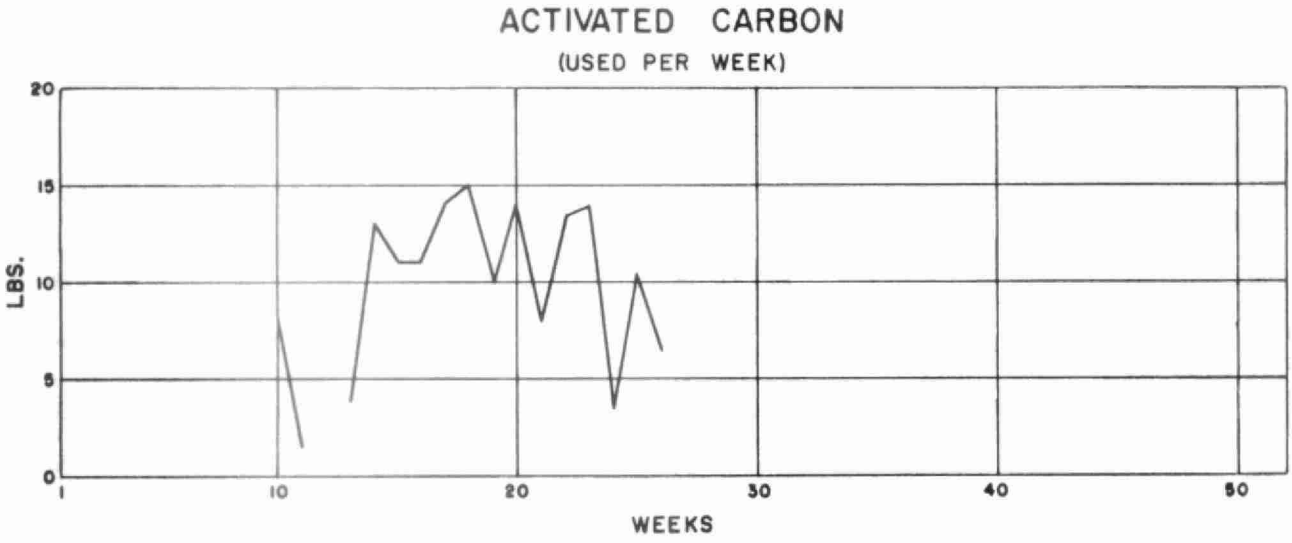
Process Data

The total 1964 flow was 18,690,000 gallons of water giving an average daily flow of 51,000 gallons per day. The peak day was June 30, 1964 which had a demand of 198,000 gallons per day.

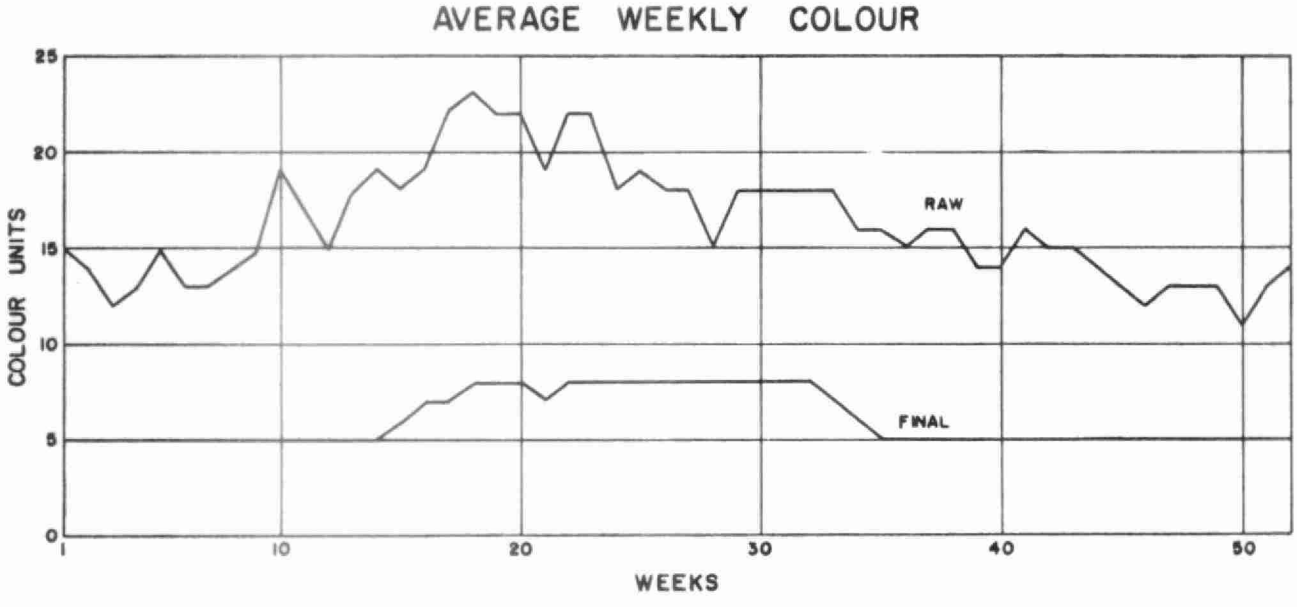
The probability plot shows that for fifty percent of the time, the daily flow exceeded 54,000 gallons per day and that it was in excess of 70,000 gallons per day for ten percent of the time.

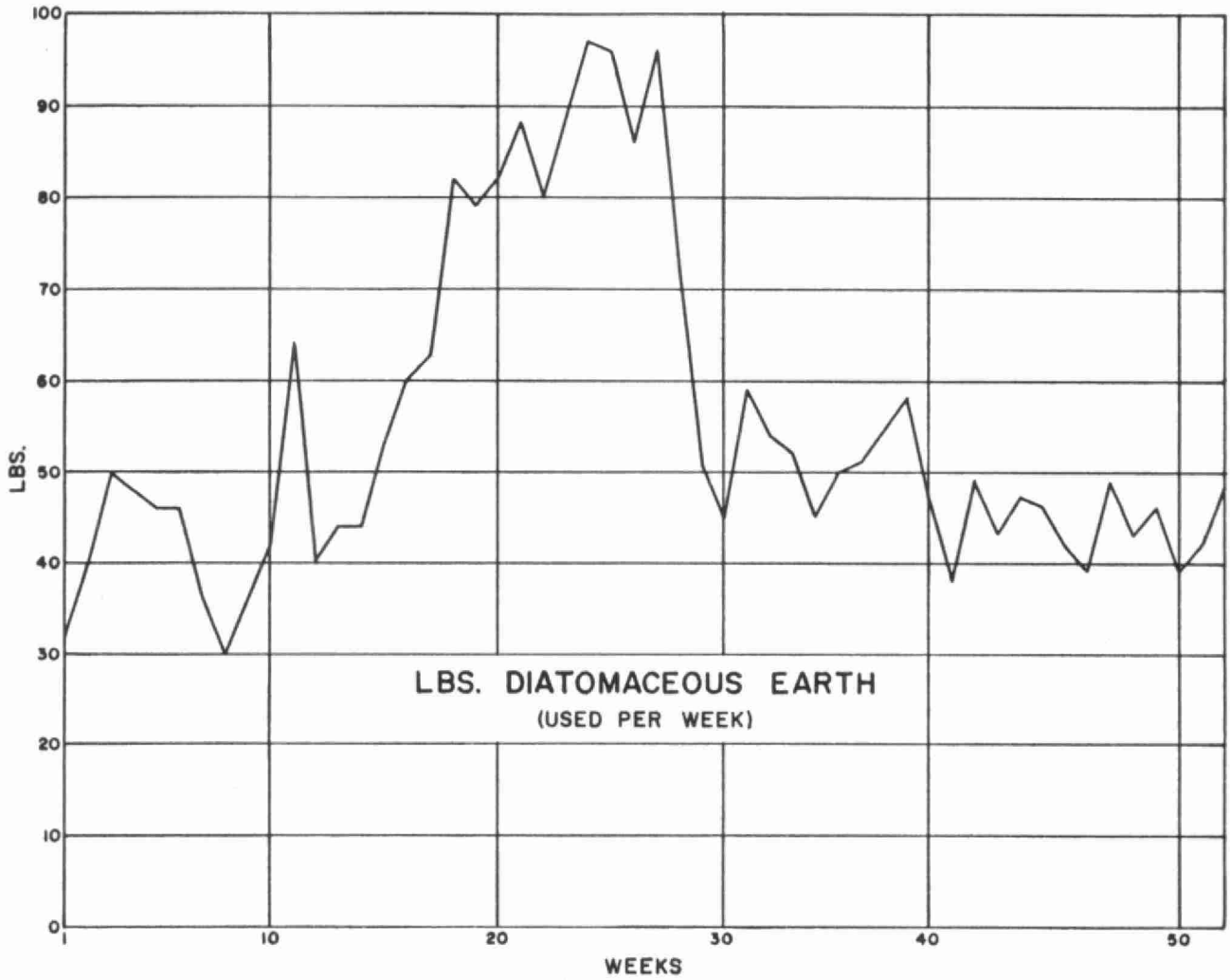

1964 DAILY FLOW
1.0
.10
.09
.08
.07
.06
.05
.04
.03
.02
.01
.01
.001
MGD
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PERCENT EQUAL TO OR GREATER THAN


TOTAL MONTHLY FLOWS
MGD
5.0
4.0
3.0
2.0
1.0
0
JAN FEB MAR APR MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1962
1963
1964
19
19



Activated carbon was used mainly in the second quarter of 1964. This additive was used to control the colour of the raw water which was high during this period.





The addition of diatomaceous earth to the raw water noticeably increased during the late spring and early summer of 1964. More of this filter aid was needed to reduce the higher raw water turbidity peculiar to this time of year.

CHEMICAL SAMPLE RESULTS

Date	Sample	Hardness as Ca CO_3	Alkalinity as $CaCO_3$	Iron	Chloride	Colour - Hazen	Turbidity
January 6	Raw	106	84	0.12	7	15	0.7
	Filtered	108	84	0.08	8	15	0.2
March 19	Raw					15	0.5
	Filtered					10	0.3
June 23	Raw					25	1.7
	Filtered					15	0.5
July 30	Raw	94	70	0.23	4	10	1.0
	Filtered					10	1.1
September 30	Raw					10	1.1
	Filtered					5	0.2
October 28	Raw	92	70	0.21	7	< 5	0.7
	Filtered	92	70	0.28	6	5	1.4
December 3	Raw					10	2.5
	Filtered					< 5	1.4

BACTI RESULTS

DATE	RAW	FILTER	DIST.SYS.
January 6	0	0	
March 17	6	0	0
June 23	22	0	0
July 28	28	0	0
September 16	66	0	
September 30	15	0	0
October 28	40	0	
December 1	4	0	0

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	1.346	21.0	1.56
FEBRUARY	1.246	20.9	1.68
MARCH	1.478	29.1	1.97
APRIL	1.316	21.5	1.63
MAY	1.437	30.4	2.12
JUNE	2.131	47.6	2.23
JULY	1.985	47.6	2.40
AUGUST	1.751	48.3	2.76
SEPTEMBER	1.761	29.4	1.67
OCTOBER	1.421	21.6	1.52
NOVEMBER	1.394	22.4	1.61
DECEMBER	1.424	22.2	1.56
TOTAL	18.690	362.0	-
AVERAGE	1.558	30.2	1.94

COMMENTS

A total of 362 pounds of chlorine was added to the treated water during 1964 in order to disinfect it and maintain a chlorine residual of 0.5 parts per million.

CONCLUSIONS

Throughout 1964, the Marmora Water Treatment Plant has supplied 18,690,000 gallons of treated water to the Village distribution system. The diatomaceous earth filter produced a high quality product and the addition of activated carbon during the spring months helped control the high colour of the raw water at that time.

With the construction of new main extensions in 1965, the demand is expected to increase considerably. Water mains will cover more of the Village, making treated water available to more consumers, and providing additional fire protection for the Village.


ONTARIO WATER RESOURCES COMMISSION